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LONG INTERNAL GRAVITY WAVES: DYNAMICS AND WAVE-INDUCED TRANSPORT

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Traditional numerical modeling studies are focused on quasi-geostrophic (QG) oceanic motions. In particular, diffusion of scalars, e.g. heat and bio-geochemical quantities, is modeled based on parameterizations of 2D eddy turbulence effects. However, the shallow-water equations contain additional solutions known as inertia-gravity (IG) oscillations whose role has not been fully appreciated. Our theoretical and experimental studies indicate that these, essentially nonlinear, motions (which also include internal tides) - and which we treat as 'wave turbulence' - may play an important role in the horizontal transport of tracers, in the spatial variations of tracer concentration, and in the overall energy and momentum balance in some ocean regions. Arctic Ocean provides just one such example, for the level of QG turbulence there is comparable to, of even below, that of baroclinic IG wave turbulence. In general, the mean transport (in the manner of the Stokes drift), 'turbulent' diffusion and fluctuations of ocean tracers caused by BIG waves become particularly important at latitudes above 45 degree. A review of our theoretical, experimental, and modeling results obtained in the last several years is presented in this talk.